Physical Review B - Condensed Matter and Materials Physics 2009 vol.79 N17

Coherent spin manipulations in Yb3+: CaWO4 at X - And W -band EPR frequencies

Rakhmatullin R., Kurkin I., Mamin G., Orlinskii S., Gafurov M., Baibekov E., Malkin B., Gambarelli S., Bertaina S., Barbara B.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Coherent spin dynamics of impurity Yb3+ ions in the CaWO4 single crystal has been studied using X - and W -band EPR. Rabi oscillations of the sample magnetization with damping times comparable to their period, driven by pulses of the microwave field with duration up to 5μs, were observed. The largest value of the single-qubit figure of merit (~6400) is obtained for the high-field component in the Y 171 b X -band EPR spectrum. The spin-lattice relaxation time of the Yb3+ ions shortens with the increasing resonance frequency while the phase memory time, in contrast, grows noticeably. Variations of the phase memory times are interpreted in terms of spectral and instantaneous diffusions. The increase of the coherence time at the W band can be used for the application of rare-earth ions as qubits in quantum computing as it has been proposed recently.

http://dx.doi.org/10.1103/PhysRevB.79.172408